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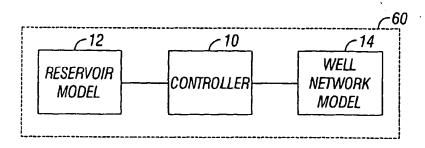
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(54) Title: OPTIMIZING WELL SYSTEM MODELS



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(57) Abstract: The invention is a controller (10) functionally associated with a reservoir model (12), a well network model (14), and a processing plant model and is adapted to optimize any one, two, or all three of the models. The controller can optimize the models using multiple, the same, or different optimizer modules.

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C. DOCUM	ENTS CONSIDERED TO BE RELEVANT						
Calegory *	Citation of document, with indication, where appropriate, of the re	levant passages	Relevant to claim No.				
Х	TRICK M D: "A different approac	h to	1-63				
	coupling a reservoir simulator w	ith a					
	surface facilities model" , SPE, XX, XX, NR. SPE 40001, PAGE(S) 285-290 XP002240561						
	column 4, paragraph 4 —column 5, paragraph						
	3						
x -	BYER T J ET AL: "Preconditioned	Newt on	1-63				
	methods for fully coupled reserve	oir and	, 1-03				
	surface facility models" . SPE A	NNUAL					
	TECHNICAL CONFERENCE AND ÉXHIBIT XX, NR. SPE 49001, PAGE(S) 181-1	ION, XX,					
	XP002240559	56					
	column 1, paragraph 3 -column 2,						
	2						
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.(Continua	ition) DOCUMENTS CONSIDERED TO BE RELEVANT	PC1/GB 03/04/64
ategory °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ZHUANG X ET AL: "PARALLELIZING A RESERVOIR SIMULATOR USING MPI", PROCEEDINGS OF THE SCALABLE PARALLEL LIBRARIES CONFERENCE, XX, XX, PAGE(S) 165-174 XP002937117 the whole document	1-63
x	US 2002/049575 A1 (BETANCOURT SORAYA S ET AL) 25 April 2002 (2002-04-25) column 1, paragraph 3 -column 4, paragraph 4	1-63
	Many diagrams fraggisms	,
		·
	(continuation of second cheet) (July 1392)	



PCT/GB 03/04764

Patent document cited in search report	Publication date	Patent family member(s)		
US 2002049575 A1	25-04-2002		04 A1 28-03-2002 00 A ,B 08-05-2002 70 A ,B 31-12-2002 03 A 21-03-2002	